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West Europe Report

SCIENCE AND TECHNOLOGY

(FOUO 11/80)



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INDUSTRIAL TECHNOLOGY

MACHINE TOOL INDUSTRY REVIEWED

General Commentary

Paris AIR & COSMOS in French 31 May 80 p 32

[Text] Reaching a production rate of up to 10 Airbuses per month by 1985 induces a significant demand for machine tools. First, let us evaluate the part to be played in this production by machines: 50 percent of the French portion of it. In other words, half the time involved in France's share of Airbus production goes into machine-tool operations as distinguished from "manual" operations such as assembly, fitting, metalsmithing, etc.

Of this 50 percent, material-removing machines* account for the largest single portion (60 percent, of which half are milling machines); material-forming machines** account for another 20 percent. AEROSPATIALE [National Industrial Aerospace Company], if for no other reason than to plan its investment program, has made the following calculation: each Airbus added to the monthly production rate requires the installation of 30 additional milling machines (for the French portion of that additional production alone)! Since these machines cost 2-10 million francs each, let us say 5 million francs each on average, one additional Airbus per month induces an additional 150-million franc market for milling machines...

To this must be added 8 machine-finishing centers, still per additional Airbus per month, representing another 20-million franc market offered to industrialists.

* Machines for shaping materials by removal of material, i.e., by cutting, shearing, abrading, and other material-removing processes (chemical, electrochemical, electronic, ultrasonic, etc.).

** Impact, bending, pressing, squeezing and other machines for shaping materials by forming processes not involving removal of material.

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And to these, lastly, must be added 25 conventional machine-tools such as lathes, grinders, and jig borers, especially among subcontractors. Going from 3 Airbuses per month today to 10 per month in 1985 thus represents an expenditure totaling over 1 billion francs over the next 5 years for machine tools!

Despite this, the French machine tool industry is heard to complain from time to time about a certain halfheartedness on the part of AEROSPATIALE about committing itself... For Mr Berthier, industrial director of AEROSPATIALE, this accusation lacks validity: "We have publicized these figures. The market is known. Whatever happens, we will produce, at the very least, 600-700 Airbuses, and, we hope, many more!"

Adding to the machine-tool delivery period (18 months on average) the 2-year production cycle per plane, the machine tools ordered today will put Airbuses "in the air" beginning by the end of 1983... This means that a portion of that billion-franc market has already materialized and--what is comforting--that Airbus production to the end of 1983 must already have been assured in terms of machine tools. The needs of 1984-1985 and beyond have yet to be covered.

These quick calculations show that the Airbus in fact generates substantial induced needs and that time is now pressing. They are also revealing the existence of limitations on an industry's adaptability to rapid increases in demand: Should it be expected to embark in 1975 (or 1980) on the development of a new machine designed to produce Airbuses scheduled to become operational in 1980 (or 1985)?

AEROSPATIALE counters with several arguments: Firstly, machine tools are taking on an increasing proportion of the production workload: hydraulic cylinder presses that eliminate finishing processes, automatic riveting machines, etc. And secondly, the industry should know that its market is not limited solely to the Airbus. AEROSPATIALE certainly cannot be expected to encourage the French machine-tool industry to work for Boeing, but it also knows that Line, TMI and undoubtedly other companies have in fact not awaited such encouragement to do business with Boeing subcontractors!

How does Mr Berthier view the competitive position of the French machine-tool industry? The response is neither simple nor an only one. "We have in France some noteworthy machine tool suppliers, especially as regards milling machines. But the industry is also suffering from a late start in certain product lines such as machine-finishing centers, indeed from not having even shown any interest in certain products such as hydraulic cylinder presses. As regards prices, the Japanese are very competitive, and their post-sale services are unequalled."

Overall, AEROSPATIALE estimates the French share of its current machine-tool orders at about 70 percent in terms of value, as compared with 30 percent 7-8 years ago. The proportion has therefore been inverted, owing

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particularly to the strong position of French suppliers of top-of-the-line milling machines, multiple-head machines for machining of panels (average size 2m x 6m for the Airbus). "The machine-tool industry must be prepared to meet strengthened Japanese competition. It must 'beef up' its competitiveness and improve its products still more in terms of safety, reliability, productivity and ergonomics."

Line* Company

Paris AIR & COSMOS in French 31 May 80 pp 46-47

[Text] One needs to have one day visited the Line "Titan" (weighing up to 700 tons) assembly plant to realize how an industry, an aeronautics in particular, can be based on an exceptional line of capital machinery. Line has a history of almost 150 years (founded in 1835) of deep involvement in aeronautics: Line is set up in Albert (Somme) within a stone's throw of AEROSPATIALE's [National Industrial Aerospace Company] Meaulte plant; that is, in the very cradle of aeronautics since the 1930's: It is to be remembered that the Henry Potez plant facilities at that time produced thousands of planes there at the rate of 50 planes per month!

The Line shops were already then working for the aeronautics industry. The firms are doubtless rare that, like Line, can show you a catalog dated 15 May 1935 titled "Specialized Machines for Aircraft Factories"!

In 1950, the company decided to concentrate on the planomiller line. The company grew steadily. During the years 1968-1973, which saw the revival of the aeronautics industry, Line (together with GSP at the time) produced many milling machines, already of the NC [numerical control] type, for the industry.

Line's growth continued: Its annual turnover increased from 32 million francs in 1973-1974 to 46 million in 1974-1976, to 62 in 1975-1976, to 95 million in 1977, and to 180 million in 1979.

What is more, Line meanwhile became one of the poles around which restructuring of the French machine-tool industry revolved. Line absorbed successively Mecanique et Technique, the Gambin Works in Luzey, the GSP Works in Albert, and Landis Gendron. Line then had to streamline its structure and created a holding company--Line PSM--to exercise ownership control over Line, AMO (the former GSP of Albert), Gambin, Gendron and Line Precision (the former Gambin of Luzey). The Line group consists of nine works in France, and one in Canada employing 2,300 persons, and has a projected 1980 turnover of 550 million francs, which positions the group immediately behind Renault-Machine tools in France. An equally remarkable fact is that

* [pronounced lee-NAY]

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is and will continue being a family-owned enterprise. The current managing heads (Mr Henri Line and Mr Pierre Line) are the fourth generation of Line; their father, Mr Andre Line, is honorary president.

Line's position abroad is now a reality: Line derives 80 percent of its turnover from exports, mainly to Eastern Europe. Line Canada has also just been awarded a 10-million franc development contract for a 5-axis machine for the Canadian aeronautics industry.

Line has also signed cooperation agreements with several foreign firms.

In all truth, Line has in recent years derived only a very small portion of its turnover from the aeronautics sector. But all evidence indicates that the firm is currently deploying a major effort in this market. Line is offering its range of NC millers, with principal characteristics as shown in the accompanying table "Line Machine Tools for the Aeronautics Industry." Line has already chalked up some recent successes directly linked to the increased demand flowing from the current European and American aeronautical programs. Line has booked orders amounting to 35 million francs from the aeronautics industry, half of which are from North America. Noteworthy are the contracts it has been awarded in Canada recently through its subsidiary Line Canada by UDT, Canadair and, most recently, De Havilland Canada.

Pursuing its policy of penetrating the North American market, Line plans to establish an industrial plant there next year.

Heavy-duty millers are one of Line's specialties. Between its subsidiaries Line AMO and Saint-Etienne Machine Outil, the Line group employs 1,200 persons in this sector, with a turnover of 350 million francs, three-fourths of which are exports. Line estimates it covers more than half the French production of heavy machine tools, with its engine lathes, combined boring and milling machines, and horizontal- and vertical-spindle machine-finishing centers.

The principal characteristics of the machine tools Line is currently offering to the aerospace industry are given in the accompanying table [as published; same table as mentioned above].

From the technical standpoint, the outstanding thing about Line machines is undoubtedly the degree of dimensional precision demanded of them despite the enormous mass of their moving components. Their standard tolerance is of the order of a few hundredths over a length of 10 meters [as published]; tolerances of different sections are not cumulative.

To achieve such precision, Line must use optical methods of alignment, involving lasers to a great extent.

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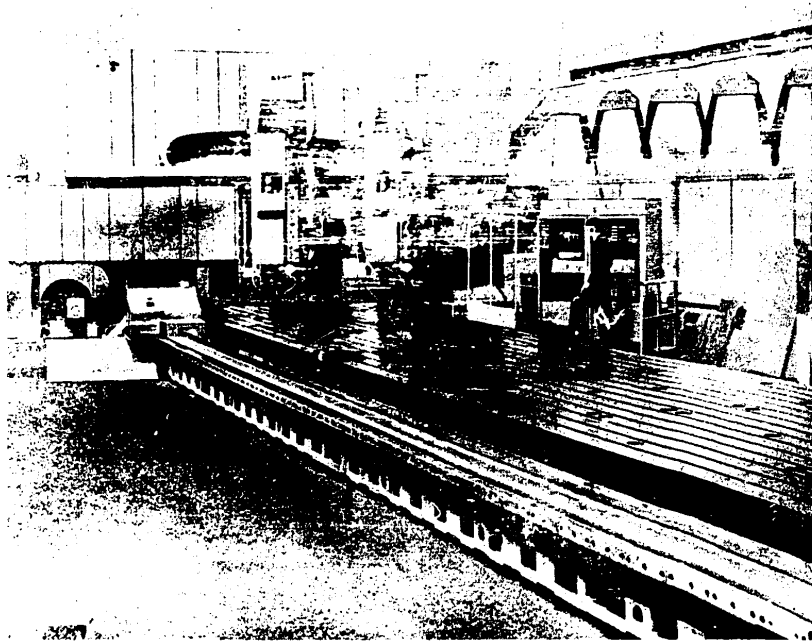
S 225 MBNU Milling Machine installed in UDT plant, Montreal, Canada
for aircraft production (mainly under Boeing subcontract).

Principal characteristics:

- Numerical control
- 2 columns, 2.5 m between columns
- 3 spindles with twist movement $\pm 20^\circ$ (4 axes)
- Gantry travel: 7.8 m
- Table size: 2.5 m wide, 7.5 m long
- Mixed heads, 20 rpm to 4,000 rpm
- Power: 20 kW per head

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Line 232 MBNU Special Aeronautics Milling Machine,
installed in AMD plant, Argenteuil.

Principal characteristics:

- 4 heads, 3 axes, 80 hp per head between 500 rpm and 4,000 rpm
- 3.3 m between columns
- Table size: 17.6 m long, 3.2 m wide
- X-travel 15 m, Y-travel 3.2 m, Z-travel 0.65 m
- Telemecanique NUM 450 Numerical Control, 9 axes (1 X + 4 Y + 4 Z)

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In all Line heavy-duty millers, movement of the gantry or of the table in the guideways is effected by hydrostatic drives. This technique makes it possible to achieve a heavy load-handling capacity and a high degree of rigidity.

Control of the table is effected by single or double rack-and-pinion gearing. Both systems (patented) are characterized by little or no reactive effect on the table drive.

It should also be noted that the assembly shop temperature must be regulated within very narrow limits. It must be kept uniform from floor level to 10 meters above floor level, regardless of outside temperatures and within a tolerance of 1 degree. Furthermore, the shop temperature must not vary more than 1 degree in 24 hours. Such close regulation is probably unique.

Adherence to these temperature limits ensures the maximum possible precision of the machine, and the client is thus able to utilize its maximum capabilities.

The machine is initially aligned at the plant in Albert, and is realigned after installation.

As regards numerical control, Line has obviously had a great deal of experience, since Line milling machines designed for the aeronautics have been so equipped since the beginning of the 1970's. Line equips its machines with numerical controls as specified by the client, and, for this purpose, has its own design department, electronic assembly shop and electric cabling shop on the premises of its Albert works. Line also got an early start on computerizing the control of its machines in accordance with the principles of DNC [direct numerical control]. Besides performing conventional numerical control functions, the computer can:

- perform the necessary calculations, in real time, to correct the trajectory at any point, nullifying any variations that have taken place up to that point and restoring zero starting error from that point onward;

- control 4 milling machines simultaneously;

- perform complex trajectory calculations;

- permit the use of differently coded tapes;

- log all data necessary to the servicing and maintenance of the machine;

- integrate the system into a complex consisting of other computers and other machines.

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Line Machine Tools for the Aeronautics Industry *

1. Traveling-Gantry Milling Machines

Capacity between columns: 1.2 m to 6 m
Travel: 2 m to 20 m
Number of heads: 1 to 8
Power per head: 15 hp to 80 hp for light alloys, 15 hp to 45 hp for
hard metals

2. Fixed-Gantry, Traveling-Table Milling Machines

Capacity between columns: 1.2 m to 6 m
Table travel: 2 m to 20 m
Number of heads: 1 to 8
Power per head: 15 hp to 80 hp for light alloys, 15 hp to 150 hp for
hard metals

3. Face-Milling Machines (for Light Alloys)

Capacity between columns: 1.5 m to 4 m
Travel: 4 m to 20 m
Power: up to 400 hp, 1 to 2 heads

4. "Paramill" Type Milling Machine (Gooseneck Type)

Table travel: 2 m to 4 m
Power: 20 hp to 50 hp, 1 to 4 heads

5. Special Machines

Examples: Milling machines for machining of helicopter blades, landing
struts, etc...

* All machines described in this listing are equipped with numerical
control, 3, 4 or 5 axes. They can all be equipped with an automatic
tool-changing device and a palletizing system.

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INDUSTRIAL TECHNOLOGY

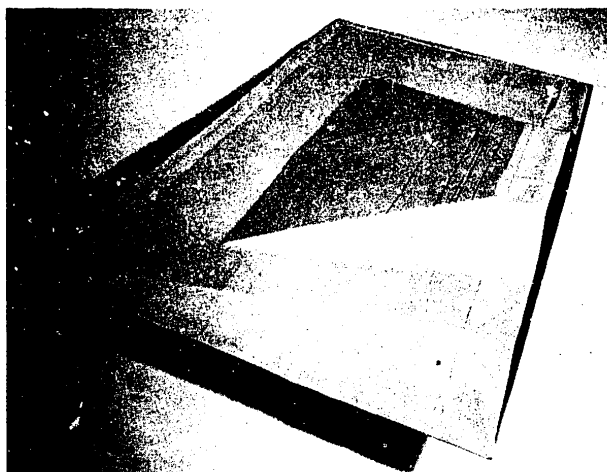
AERITALIA PRODUCES COMPONENTS FOR BOEING

Paris AIR & COSMOS in French 24 May 80 p 17

[Text] In our preceding issue (page 20) we noted the military air transport aircraft program G-222 which Aeritalia is carrying out in its Pomigliano d'Arco factory. It is in this same plant, that two-thirds of the work, and in the Turin plant that one third of the work of fabrication of components of the Boeing 767 is beginning for Boeing's account and in the framework of a joint effort the lines of division of which we gave in our 26 August 1978 issue No 728. The American manufacturer has entrusted to Aeritalia the production of the following: high-lift flaps, internal ailerons (mixed construction: carbon fibers and light metal), leading edge flaps (cemented metallic constructions), wingtip fairings (classical construction), elevators (honeycomb sandwich construction) vertical stabilizer assembly (carbon fibers).

The first assembly stands were set up a month ago and the photographs shown above were taken on that occasion: on the left inboard spoiler of composite materials: to the right, rudders of carbon fibers. Its dimensions are relatively large, but due to the light weight, two men are enough to carry it. On the technological level Aeritalia is profiting from its cooperation with Boeing in the construction of the B767. It should be noted that Aeritalia is also building elements of the DC9 and DC10 for McDonnell Douglas.

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